

SEQUENCE LISTING

(1) GENERAL INFORMATION:

(i) APPLICANT:

(A) NAME: The University of Wales  
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(B) STREET: Bell Vue, Llanilar  
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(A) NAME: Kell, Douglas B.  
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(B) STREET: Belle Vue, Llanilar  
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(F) POSTAL CODE (ZIP): SY23 4PG

(ii) TITLE OF INVENTION: Bacterial Pheromones and Uses Therefor

(iii) NUMBER OF SEQUENCES: 59

(iv) COMPUTER READABLE FORM:

(A) MEDIUM TYPE: Floppy disk  
(B) COMPUTER: IBM PC compatible  
(C) OPERATING SYSTEM: PC-DOS/MS-DOS  
(D) SOFTWARE: PatentIn Release #1.0, Version #1.25 (EPO)

(v) CURRENT APPLICATION DATA:

APPLICATION NUMBER: Not Assigned

(vi) PRIOR APPLICATION DATA:

(A) APPLICATION NUMBER: PCT/GB98/01619  
(b) FILING DATE: 03-MAY-1998

(vi) PRIOR APPLICATION DATA:

(A) APPLICATION NUMBER: GB 9711389.8  
(B) FILING DATE: 04-JUN-1997

(vi) PRIOR APPLICATION DATA:  
(A) APPLICATION NUMBER: GB 9811221.2  
(B) FILING DATE: 27-MAY-1998

(2) INFORMATION FOR SEQ ID NO:1:

(i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 362 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:1:

Met Leu Arg Leu Val Val Gly Ala Leu Leu Leu Val Leu Ala Phe Ala  
1 5 10 15  
Gly Gly Tyr Ala Val Ala Ala Cys Lys Thr Val Thr Leu Thr Val Asp  
20 25 30  
Gly Thr Ala Met Arg Val Thr Thr Met Lys Ser Arg Val Ile Asp Ile  
35 40 45  
Val Glu Glu Asn Gly Phe Ser Val Asp Asp Arg Asp Asp Leu Tyr Pro  
50 55 60  
Ala Ala Gly Val Gln Val His Asp Ala Asp Thr Ile Val Leu Arg Arg  
65 70 75 80  
Ser Arg Pro Leu Gln Ile Ser Leu Asp Gly His Asp Ala Lys Gln Val  
85 90 95  
Trp Thr Thr Ala Ser Thr Val Asp Glu Ala Leu Ala Gln Leu Ala Met  
100 105 110  
Thr Asp Thr Ala Pro Ala Ala Ala Ser Arg Ala Ser Arg Val Pro Leu  
115 120 125  
Ser Gly Met Ala Leu Pro Val Val Ser Ala Lys Thr Val Gln Leu Asn  
130 135 140  
Asp Gly Gly Leu Val Arg Thr Val His Leu Pro Ala Pro Asn Val Ala  
145 150 155 160  
Gly Leu Leu Ser Ala Ala Gly Val Pro Leu Leu Gln Ser Asp His Val  
165 170 175  
Val Pro Ala Ala Thr Ala Pro Ile Val Glu Gly Met Gln Ile Gln Val  
180 185 190  
Thr Arg Asn Arg Ile Lys Lys Val Thr Glu Arg Leu Pro Leu Pro Pro  
195 200 205  
Asn Ala Arg Arg Val Glu Asp Pro Glu Met Asn Met Ser Arg Glu Val  
210 215 220

Val Glu Asp Pro Gly Val Pro Gly Thr Gln Asp Val Thr Phe Ala Val  
225 230 235 240

Ala Glu Val Asn Gly Val Glu Thr Gly Arg Leu Pro Val Ala Asn Val  
245 250 255

Val Val Thr Pro Ala His Glu Ala Val Val Arg Val Gly Thr Lys Pro  
260 265 270

Gly Thr Glu Val Pro Pro Val Ile Asp Gly Ser Ile Trp Asp Ala Ile  
275 280 285

Ala Gly Cys Glu Ala Gly Gly Asn Trp Ala Ile Asn Thr Gly Asn Gly  
290 295 300

Tyr Tyr Gly Gly Val Gln Phe Asp Gln Gly Thr Trp Glu Ala Asn Gly  
305 310 315 320

Gly Leu Arg Tyr Ala Pro Arg Ala Asp Leu Ala Thr Arg Glu Glu Gln  
325 330 335

Ile Ala Val Ala Glu Val Thr Arg Leu Arg Gln Gly Trp Gly Ala Trp  
340 345 350

Pro Val Cys Ala Ala Arg Ala Gly Ala Arg  
355 360

(2) INFORMATION FOR SEQ ID NO:2:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 188 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:2:

Met Pro Val Gly Trp Leu Trp Arg Ala Arg Thr Ala Lys Gly Thr Thr  
1 5 10 15

Leu Lys Asn Ala Arg Thr Thr Leu Ile Ala Ala Ala Ile Ala Gly Thr  
20 25 30

Leu Val Thr Thr Ser Pro Ala Gly Ile Ala Asn Ala Asp Asp Ala Gly  
35 40 45

Leu Asp Pro Asn Ala Ala Ala Gly Pro Asp Ala Val Gly Phe Asp Pro  
50 55 60

Asn Leu Pro Pro Ala Pro Asp Ala Ala Pro Val Asp Thr Pro Pro Ala  
65 70 75 80

Pro Glu Asp Ala Gly Phe Asp Pro Asn Leu Pro Pro Pro Leu Ala Pro  
85 90 95

Asp Phe Leu Ser Pro Pro Ala Glu Glu Ala Pro Pro Val Pro Val Ala  
100 105 110

Tyr Ser Val Asn Trp Asp Ala Ile Ala Gln Cys Glu Ser Gly Gly Asn  
115 120 125

Trp	Ser	Ile	Asn	Thr	Gly	Asn	Gly	Tyr	Tyr	Gly	Gly	Leu	Arg	Phe	Thr
130						135					140				
Ala	Gly	Thr	Trp	Arg	Ala	Asn	Gly	Gly	Ser	Gly	Ser	Ala	Ala	Asn	Ala
145					150					155					160
Ser	Arg	Glu	Glu	Gln	Ile	Arg	Val	Ala	Glu	Asn	Val	Leu	Arg	Ser	Gln
				165					170					175	
Gly	Ile	Arg	Ala	Trp	Pro	Val	Cys	Gly	Arg	Arg	Gly				
			180					185							

(2) INFORMATION FOR SEQ ID NO:3:

(i) SEQUENCE CHARACTERISTICS:  
 (A) LENGTH: 174 amino acids  
 (B) TYPE: amino acid  
 (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:3:

Met	Ser	Glu	Ser	Tyr	Arg	Lys	Leu	Thr	Thr	Ser	Ser	Ile	Ile	Val	Ala
1				5					10					15	
Lys	Ile	Thr	Phe	Thr	Gly	Ala	Met	Leu	Asp	Gly	Ser	Ile	Ala	Leu	Ala
			20					25					30		
Gly	Gln	Ala	Ser	Pro	Ala	Thr	Asp	Ser	Glu	Trp	Asp	Gln	Val	Ala	Arg
		35				40						45			
Cys	Glu	Ser	Gly	Gly	Asn	Trp	Ser	Ile	Asn	Thr	Gly	Asn	Gly	Tyr	Leu
	50					55					60				
Gly	Gly	Leu	Gln	Phe	Ser	Gln	Gly	Thr	Trp	Ala	Ser	His	Gly	Gly	Gly
65					70					75					80
Glu	Tyr	Ala	Pro	Ser	Ala	Gln	Leu	Ala	Thr	Arg	Glu	Gln	Gln	Ile	Ala
				85					90					95	
Val	Ala	Glu	Arg	Val	Leu	Ala	Thr	Gln	Gly	Ser	Gly	Ala	Trp	Pro	Ala
			100					105					110		
Cys	Gly	His	Gly	Leu	Ser	Gly	Pro	Ser	Leu	Gln	Glu	Val	Leu	Pro	Ala
		115					120					125			
Gly	Met	Gly	Ala	Pro	Trp	Ile	Asn	Gly	Ala	Pro	Ala	Pro	Leu	Ala	Pro
	130					135					140				
Pro	Pro	Pro	Ala	Glu	Pro	Ala	Pro	Pro	Gln	Pro	Pro	Ala	Asp	Asn	Phe
145					150					155					160
Pro	Pro	Thr	Pro	Gly	Asp	Val	Pro	Ser	Pro	Leu	Ala	Arg	Pro		
				165					170						

(2) INFORMATION FOR SEQ ID NO:4:

(i) SEQUENCE CHARACTERISTICS:  
 (A) LENGTH: 407 amino acids

(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:4:

Met	Ser	Gly	Arg	His	Arg	Lys	Pro	Thr	Thr	Ser	Asn	Val	Ser	Val	Ala	1	5	10	15
Lys	Ile	Ala	Phe	Thr	Gly	Ala	Val	Leu	Gly	Gly	Gly	Gly	Ile	Ala	Met	20	25	30	
Ala	Ala	Gln	Ala	Thr	Ala	Ala	Thr	Asp	Gly	Glu	Trp	Asp	Gln	Val	Ala	35	40	45	
Arg	Cys	Glu	Ser	Gly	Gly	Asn	Trp	Ser	Ile	Asn	Thr	Gly	Asn	Gly	Tyr	50	55	60	
Leu	Gly	Gly	Leu	Gln	Phe	Thr	Gln	Ser	Thr	Trp	Ala	Ala	His	Gly	Gly	65	70	75	80
Gly	Glu	Phe	Ala	Pro	Ser	Ala	Gln	Leu	Ala	Ser	Arg	Glu	Gln	Gln	Ile	85	90	95	
Ala	Val	Gly	Glu	Arg	Val	Leu	Ala	Thr	Gln	Gly	Arg	Gly	Ala	Trp	Pro	100	105	110	
Val	Cys	Gly	Arg	Gly	Leu	Ser	Asn	Ala	Thr	Pro	Arg	Glu	Val	Leu	Pro	115	120	125	
Ala	Ser	Ala	Ala	Met	Asp	Ala	Pro	Leu	Asp	Ala	Ala	Ala	Val	Asn	Gly	130	135	140	
Glu	Pro	Ala	Pro	Leu	Ala	Pro	Pro	Pro	Ala	Asp	Pro	Ala	Pro	Pro	Val	145	150	155	160
Glu	Leu	Ala	Ala	Asn	Asp	Leu	Pro	Ala	Pro	Leu	Gly	Glu	Pro	Leu	Pro	165	170	175	
Ala	Ala	Pro	Ala	Asp	Pro	Ala	Pro	Pro	Ala	Asp	Leu	Ala	Pro	Pro	Ala	180	185	190	
Pro	Ala	Asp	Val	Ala	Pro	Pro	Val	Glu	Leu	Ala	Val	Asn	Asp	Leu	Pro	195	200	205	
Ala	Pro	Leu	Gly	Glu	Pro	Leu	Pro	Ala	Ala	Pro	Ala	Asp	Pro	Ala	Pro	210	215	220	
Pro	Ala	Asp	Leu	Ala	Pro	Pro	Ala	Pro	Ala	Asp	Leu	Ala	Pro	Pro	Ala	225	230	235	240
Pro	Ala	Asp	Leu	Ala	Pro	Pro	Ala	Pro	Ala	Asp	Leu	Ala	Pro	Pro	Val	245	250	255	
Glu	Leu	Ala	Val	Asn	Asp	Leu	Pro	Ala	Pro	Leu	Gly	Glu	Pro	Leu	Pro	260	265	270	
Ala	Ala	Pro	Ala	Glu	Leu	Ala	Pro	Pro	Ala	Asp	Leu	Ala	Pro	Ala	Ser	275	280	285	

Ala Asp Leu Ala Pro Pro Ala Pro Ala Asp Leu Ala Pro Pro Ala Pro  
 290 295 300

Ala Glu Leu Ala Pro Pro Ala Pro Ala Asp Leu Ala Pro Pro Ala Ala  
 305 310 315 320

Val Asn Glu Gln Thr Ala Pro Gly Asp Gln Pro Ala Thr Ala Pro Gly  
 325 330 335

Gly Pro Val Gly Leu Ala Thr Asp Leu Glu Leu Pro Glu Pro Asp Pro  
 340 345 350

Gln Pro Ala Asp Ala Pro Pro Pro Gly Asp Val Thr Glu Ala Pro Ala  
 355 360 365

Glu Thr Pro Gln Val Ser Asn Ile Ala Tyr Thr Lys Lys Leu Trp Gln  
 370 375 380

Ala Ile Arg Ala Gln Asp Val Cys Gly Asn Asp Ala Leu Asp Ser Leu  
 385 390 395 400

Ala Gln Pro Tyr Val Ile Gly  
 405

(2) INFORMATION FOR SEQ ID NO:5:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 155 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:5:

Met Pro Gly Glu Met Leu Asp Val Arg Lys Leu Cys Lys Leu Phe Val  
 1 5 10 15

Lys Ser Ala Val Val Ser Gly Ile Val Thr Ala Ser Met Ala Leu Ser  
 20 25 30

Thr Ser Thr Gly Met Ala Asn Ala Val Pro Arg Glu Pro Asn Trp Asp  
 35 40 45

Ala Val Ala Gln Cys Glu Ser Gly Arg Asn Trp Arg Ala Asn Thr Gly  
 50 55 60

Asn Gly Phe Tyr Gly Gly Leu Gln Phe Lys Pro Thr Ile Trp Ala Arg  
 65 70 75 80

Tyr Gly Gly Val Gly Asn Pro Ala Gly Ala Ser Arg Glu Gln Gln Ile  
 85 90 95

Thr Val Ala Asn Arg Val Leu Ala Asp Gln Gly Leu Asp Ala Trp Pro  
 100 105 110

Lys Cys Gly Ala Ala Ser Asp Leu Pro Ile Thr Leu Trp Ser His Pro  
 115 120 125

Ala Gln Gly Val Lys Gln Ile Ile Asn Asp Ile Ile Gln Met Gly Asp  
 130 135 140

Thr Thr Leu Ala Ala Ile Ala Leu Asn Gly Leu  
145 150 155

(2) INFORMATION FOR SEQ ID NO:6:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 176 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:6:

Met 1	His	Pro	Leu	Pro 5	Ala	Asp	His	Gly	Arg 10	Ser	Arg	Cys	Asn	Arg 15	His
Pro	Ile	Ser	Pro 20	Leu	Ser	Leu	Ile	Gly 25	Asn	Ile	Ser	Ala	Thr 30	Ser	Gly
Asp	Met	Ser 35	Ser	Met	Thr	Arg	Ile 40	Ala	Lys	Pro	Leu	Ile 45	Lys	Ser	Ala
Met	Ala 50	Ala	Gly	Leu	Val	Thr 55	Ala	Ser	Met	Ser	Leu	Ser	Thr	Ala	Val
Ala 65	His	Ala	Gly	Pro	Ser 70	Pro	Asn	Trp	Asp	Ala 75	Val	Ala	Gln	Cys	Glu 80
Ser	Gly	Gly	Asn	Trp 85	Ala	Ala	Asn	Thr	Gly 90	Asn	Gly	Lys	Tyr	Gly 95	Gly
Leu	Gln	Phe	Lys 100	Pro	Ala	Thr	Trp	Ala 105	Ala	Phe	Gly	Gly	Val 110	Gly	Asn
Pro	Ala	Ala 115	Ala	Ser	Arg	Glu	Gln 120	Gln	Ile	Ala	Val	Ala 125	Asn	Arg	Val
Leu	Ala 130	Glu	Gln	Gly	Leu	Asp 135	Ala	Trp	Pro	Thr	Cys 140	Gly	Ala	Ala	Ser
Gly 145	Leu	Pro	Ile	Ala	Leu 150	Trp	Ser	Lys	Pro	Ala 155	Gln	Gly	Ile	Lys	Gln 160
Ile	Ile	Asn	Glu	Ile 165	Ile	Trp	Ala	Gly	Ile 170	Gln	Ala	Ser	Ile	Pro 175	Arg

(2) INFORMATION FOR SEQ ID NO:7:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 154 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:7:

Met Thr Pro Gly Leu Leu Thr Thr Ala Gly Ala Gly Arg Pro Arg Asp

1	5	10	15
Arg Cys Ala	Arg Ile Val Cys Thr	Val Phe Ile Glu Thr	Ala Val Val
20		25	30
Ala Thr Met	Phe Val Ala Leu Leu	Gly Leu Ser Thr	Ile Ser Ser Lys
35		40	45
Ala Asp Asp	Ile Asp Trp Asp Ala	Ile Ala Gln Cys	Glu Ser Gly Gly
50		55	60
Asn Trp Ala	Ala Asn Thr Gly Asn	Gly Leu Tyr Gly	Gly Leu Gln Ile
65		70	75
Ser Gln Ala	Thr Trp Asp Ser Asn	Gly Gly Val Gly	Ser Pro Ala Ala
	85	90	95
Ala Ser Pro	Gln Gln Gln Ile	Glu Val Ala Asp	Asn Ile Met Lys Thr
	100	105	110
Gln Gly Pro	Gly Ala Trp Pro	Lys Cys Ser Ser	Cys Ser Gln Gly Asp
	115	120	125
Ala Pro Leu	Gly Ser Leu Thr	His Ile Leu Thr	Phe Leu Ala Ala Glu
	130	135	140
Thr Gly Gly	Cys Ser Gly Ser	Arg Asp Asp	
145		150	

(2) INFORMATION FOR SEQ ID NO:8:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 99 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:8:

Ile Arg Thr	Ala Ala Val Thr	Leu Val Ala Ala	Thr Ala Leu Gly	Ala
1	5	10	15	
Thr Gly Glu	Ala Val Ala Ala	Pro Ser Ala Pro	Leu Arg Thr	Asp Trp
20		25	30	
Asp Ala Ile	Ala Ala Cys Glu	Ser Ser Gly Asn	Trp Gln Ala	Asn Thr
35		40	45	
Gly Asn Gly	Tyr Tyr Gly Gly	Leu Gln Phe Ala	Arg Ser Ser	Trp Ile
50		55	60	
Ala Ala Gly	Gly Leu Lys Tyr	Ala Pro Arg Ala	Asp Leu Ala	Thr Arg
65		70	75	80
Gly Glu Gln	Ile Ala Val Ala	Glu Arg Leu Ala	Arg Leu Gln	Gly Met
	85	90	95	
Ser Ala Trp				



(2) INFORMATION FOR SEQ ID NO:9:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 438 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:9:

Met	Gly	Glu	Arg	Glu	Gly	Arg	Val	Asp	Ser	Leu	Leu	Asp	Thr	Leu	Tyr	1	5	10	15
Asn	Leu	Ser	Glu	Glu	Lys	Glu	Ala	Phe	Phe	Ile	Thr	Gln	Lys	Met	Lys	20	25	30	
Lys	Leu	Phe	Ser	Val	Lys	Leu	Ser	Lys	Ser	Lys	Val	Ile	Leu	Val	Ala	35	40	45	
Ala	Cys	Leu	Leu	Leu	Ala	Gly	Ser	Gly	Thr	Ala	Tyr	Ala	Ala	His	Glu	50	55	60	
Leu	Thr	Lys	Gln	Ser	Val	Ser	Val	Ser	Ile	Asn	Gly	Lys	Lys	Lys	His	65	70	75	80
Ile	Arg	Thr	His	Ala	Asn	Thr	Val	Gly	Asp	Leu	Leu	Glu	Thr	Leu	Asp	85	90	95	
Ile	Lys	Thr	Arg	Asp	Glu	Asp	Lys	Ile	Thr	Pro	Ala	Lys	Gln	Thr	Lys	100	105	110	
Ile	Thr	Ala	Asp	Met	Asp	Val	Val	Tyr	Glu	Ala	Ala	Lys	Pro	Val	Lys	115	120	125	
Leu	Thr	Ile	Asn	Gly	Glu	Glu	Lys	Thr	Leu	Trp	Ser	Thr	Ala	Lys	Thr	130	135	140	
Val	Gly	Ala	Leu	Leu	Asp	Glu	Gln	Asp	Val	Asp	Val	Lys	Glu	Gln	Asp	145	150	155	160
Gln	Ile	Asp	Pro	Ala	Ile	Asp	Thr	Asp	Ile	Ser	Lys	Asp	Met	Lys	Ile	165	170	175	
Asn	Ile	Glu	Pro	Ala	Phe	Gln	Val	Thr	Val	Asn	Asp	Ala	Gly	Lys	Gln	180	185	190	
Lys	Lys	Ile	Trp	Thr	Thr	Ser	Thr	Thr	Val	Ala	Asp	Phe	Leu	Lys	Gln	195	200	205	
Gln	Lys	Met	Asn	Ile	Lys	Asp	Glu	Asp	Lys	Ile	Lys	Pro	Ala	Leu	Asp	210	215	220	
Ala	Lys	Leu	Thr	Lys	Gly	Lys	Ala	Asp	Ile	Thr	Ile	Thr	Arg	Ile	Glu	225	230	235	240
Lys	Val	Thr	Asp	Val	Val	Glu	Glu	Lys	Ile	Ala	Phe	Asp	Val	Lys	Lys	245	250	255	
Gln	Glu	Asp	Ala	Ser	Leu	Glu	Lys	Gly	Lys	Glu	Lys	Val	Val	Gln	Lys	260	265	270	

Gly Lys Glu Gly Lys Leu Lys Lys His Phe Glu Val Val Lys Glu Asn  
275 280 285

Gly Lys Glu Val Ser Arg Glu Leu Val Lys Glu Glu Thr Ala Glu Gln  
290 295 300

Ser Lys Asp Lys Val Ile Ala Val Gly Thr Lys Gln Ser Ser Pro Lys  
305 310 315 320

Phe Glu Thr Val Ser Ala Ser Gly Asp Ser Lys Thr Val Val Ser Arg  
325 330 335

Ser Asn Glu Ser Thr Gly Lys Val Met Thr Val Ser Ser Thr Ala Tyr  
340 345 350

Thr Ala Ser Cys Ser Gly Cys Ser Gly His Thr Ala Thr Gly Val Asn  
355 360 365

Leu Lys Asn Asn Pro Asn Ala Lys Val Ile Ala Val Asp Pro Asn Val  
370 375 380

Ile Pro Leu Gly Ser Lys Val His Val Glu Gly Tyr Gly Tyr Ala Ile  
385 390 395 400

Ile Ala Ala Asp Thr Gly Ser Ala Ile Lys Gly Asn Lys Ile Asp Val  
405 410 415

Phe Phe Pro Ser Lys Ser Asp Ala Ser Asn Trp Gly Val Lys Thr Val  
420 425 430

Ser Val Lys Val Leu Asn  
435

(2) INFORMATION FOR SEQ ID NO:10:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 288 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:10:

Met Lys Lys Thr Ile Met Ser Phe Val Ala Val Ala Ala Leu Ser Thr  
1 5 10 15

Thr Ala Phe Gly Ala His Ala Ser Ala Lys Glu Ile Thr Val Gln Lys  
20 25 30

Gly Asp Thr Leu Trp Gly Ile Ser Gln Lys Asn Gly Val Asn Leu Lys  
35 40 45

Asp Leu Lys Glu Trp Asn Lys Leu Thr Ser Asp Lys Ile Ile Ala Gly  
50 55 60

Glu Lys Leu Thr Ile Ser Ser Glu Glu Thr Thr Thr Thr Gly Gln Tyr  
65 70 75 80

Thr Ile Lys Ala Gly Asp Thr Leu Ser Lys Ile Ala Gln Lys Phe Gly

85

90

95

Thr	Thr	Val	Asn	Asn	Leu	Lys	Val	Trp	Asn	Asn	Leu	Ser	Ser	Asp	Met
			100					105					110		
Ile	Tyr	Ala	Gly	Ser	Thr	Leu	Ser	Val	Lys	Gly	Gln	Ala	Thr	Ala	Ala
		115					120					125			
Asn	Thr	Ala	Thr	Glu	Asn	Ala	Gln	Thr	Asn	Ala	Pro	Gln	Ala	Ala	Pro
	130					135					140				
Lys	Gln	Glu	Ala	Val	Gln	Lys	Glu	Gln	Pro	Lys	Gln	Glu	Ala	Val	Gln
145					150					155					160
Gln	Gln	Pro	Lys	Gln	Glu	Thr	Lys	Ala	Glu	Ala	Glu	Thr	Ser	Val	Asn
				165					170					175	
Thr	Glu	Glu	Lys	Ala	Val	Gln	Ser	Asn	Thr	Asn	Asn	Gln	Glu	Ala	Ser
			180					185					190		
Lys	Glu	Leu	Thr	Val	Thr	Ala	Thr	Ala	Tyr	Thr	Ala	Asn	Asp	Gly	Gly
		195					200					205			
Ile	Ser	Gly	Val	Thr	Ala	Thr	Gly	Ile	Asp	Leu	Asn	Lys	Asn	Pro	Asn
	210					215					220				
Ala	Lys	Val	Ile	Ala	Val	Asp	Pro	Asn	Val	Ile	Pro	Leu	Gly	Ser	Lys
225					230					235					240
Val	Tyr	Val	Glu	Gly	Tyr	Gly	Glu	Ala	Thr	Thr	Ala	Ala	Asp	Thr	Gly
				245					250					255	
Gly	Ala	Ile	Lys	Gly	Asn	Lys	Ile	Asp	Val	Phe	Val	Pro	Glu	Lys	Ser
			260					265					270		
Ser	Ala	Tyr	Arg	Trp	Gly	Asn	Lys	Thr	Val	Lys	Ile	Lys	Ile	Leu	Asn
		275					280					285			

(2) INFORMATION FOR SEQ ID NO:11:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 320 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:11:

Lys	Arg	Xaa	Xaa	Ala	Val	Ile	Leu	Met	Val	Ala	Val	Ile	Phe	Thr	Ile
1				5					10				15		
Ile	Ser	Ser	Met	Lys	Lys	Asn	Ile	Thr	Val	Asn	Ile	Asp	Gly	Lys	Thr
			20					25					30		
Ser	Lys	Ile	Ile	Thr	Tyr	Lys	Ser	Asn	Glu	Gly	Ser	Ile	Leu	Ser	Lys
		35					40					45			
Asn	Asn	Ile	Leu	Val	Gly	Pro	Lys	Asp	Lys	Ile	Gln	Pro	Ala	Leu	Asp
50						55					60				

Thr	Asn	Leu	Lys	Asn	Gly	Asp	Lys	Ile	Tyr	Ile	Lys	Lys	Ala	Ile	Ser	65	70	75	80
Val	Glu	Val	Ala	Val	Asp	Gly	Lys	Val	Arg	Arg	Val	Lys	Ser	Ser	Glu	85	90	95	
Glu	Thr	Val	Ser	Lys	Met	Leu	Lys	Ala	Glu	Lys	Ile	Pro	Leu	Ser	Lys	100	105	110	
Val	Asp	Lys	Val	Asn	Ile	Ser	Arg	Asn	Ala	Ala	Ile	Lys	Lys	Asn	Met	115	120	125	
Lys	Ile	Ser	Ile	Thr	Arg	Val	Asn	Ser	Gln	Ile	Thr	Lys	Glu	Asn	Gln	130	135	140	
Gln	Val	Asp	Phe	Pro	Thr	Glu	Val	Ile	Ser	Asp	Asp	Ser	Met	Gly	Asn	145	150	155	160
Asp	Glu	Lys	Gln	Val	Ile	Gln	Gln	Gly	Gln	Ala	Gly	Glu	Lys	Glu	Val	165	170	175	
Phe	Thr	Lys	Ile	Val	Tyr	Glu	Asp	Gly	Lys	Ala	Val	Ser	Lys	Glu	Ile	180	185	190	
Val	Gly	Glu	Val	Ile	Lys	Lys	Glu	Pro	Thr	Lys	Gln	Val	Phe	Lys	Val	195	200	205	
Gly	Thr	Leu	Gly	Val	Leu	Lys	Pro	Asp	Arg	Gly	Gly	Arg	Val	Leu	Tyr	210	215	220	
Lys	Lys	Ser	Leu	Gln	Val	Leu	Ala	Thr	Ala	Tyr	Thr	Asp	Asp	Phe	Ser	225	230	235	240
Phe	Gly	Ile	Thr	Ala	Ser	Gly	Thr	Lys	Val	Lys	Arg	Asp	Ser	Asp	Gly	245	250	255	
Tyr	Ser	Ser	Ile	Ala	Val	Asp	Pro	Thr	Val	Ile	Pro	Leu	Gly	Thr	Lys	260	265	270	
Leu	Tyr	Val	Pro	Gly	Tyr	Gly	Tyr	Gly	Val	Val	Ala	Glu	Asp	Thr	Gly	275	280	285	
Gly	Ala	Ile	Lys	Gly	Asn	Arg	Leu	Asp	Leu	Phe	Phe	Thr	Ser	Glu	Arg	290	295	300	
Glu	Cys	Tyr	Asp	Trp	Gly	Ala	Lys	Asn	Val	Thr	Val	Tyr	Ile	Leu	Lys	305	310	315	320

(2) INFORMATION FOR SEQ ID NO:12:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 81 amino acids
  - (B) TYPE: amino acid
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:12:

Ala Glu Ala Tyr Thr Ala Ser Gly Met His Val Leu Arg Asp Pro Asn  
 1 5 10 15  
 Gly Tyr Ser Thr Ile Ala Val Asp Pro Ser Val Ile Pro Leu Gly Thr  
 20 25 30  
 Lys Leu Tyr Val Glu Gly Tyr Gly Tyr Ala Ile Ile Ala Ala Asp Thr  
 35 40 45  
 Gly Gly Ala Ile Lys Gly Asn Arg Val Asp Leu Phe Phe Asn Thr Glu  
 50 55 60  
 Ala Glu Ala Ser Asn Trp Gly Val Arg Asn Leu Asp Val Tyr Ile Leu  
 65 70 75 80  
 Asn

(2) INFORMATION FOR SEQ ID NO:13:

- (i) SEQUENCE CHARACTERISTICS:  
 (A) LENGTH: 51 amino acids  
 (B) TYPE: amino acid  
 (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:13:

Thr Ile Val Val Lys Ser Gly Asp Ser Leu Trp Thr Leu Ala Asn Glu  
 1 5 10 15  
 Tyr Glu Val Glu Gly Gly Trp Thr Ala Leu Tyr Glu Ala Asn Lys Gly  
 20 25 30  
 Ala Val Ser Asp Ala Ala Val Ile Tyr Val Gly Gln Glu Leu Val Leu  
 35 40 45  
 Pro Gln Ala  
 50

(2) INFORMATION FOR SEQ ID NO:14:

- (i) SEQUENCE CHARACTERISTICS:  
 (A) LENGTH: 46 amino acids  
 (B) TYPE: amino acid  
 (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:14:

Thr Ile Lys Val Lys Ser Gly Asp Ser Leu Trp Lys Leu Ser Arg Gln  
 1 5 10 15  
 Tyr Asp Thr Thr Ile Ser Ala Leu Lys Ser Glu Asn Lys Leu Lys Ser  
 20 25 30  
 Thr Val Leu Tyr Val Gly Gln Ser Leu Lys Val Pro Glu Ser  
 35 40 45

Thr	Ile	Lys	Val	Lys	Ser	Gly	Asp	Ser	Leu	Trp	Lys	Leu	Ala	Gln	Thr
1				5					10					15	
Tyr	Asn	Thr	Ser	Val	Ala	Ala	Leu	Thr	Ser	Ala	Asn	His	Leu	Ser	Thr
			20					25					30		
Thr	Val	Leu	Ser	Ile	Gly	Gln	Thr	Leu	Thr	Ile	Pro				
		35					40								

(i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 43 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:16:

Thr	Tyr	Thr	Val	Lys	Ser	Gly	Asp	Ser	Leu	Trp	Val	Ile	Ala	Gln	Lys
1				5					10					15	
Phe	Asn	Val	Thr	Ala	Gln	Gln	Ile	Arg	Glu	Lys	Asn	Asn	Leu	Lys	Thr
			20					25					30		
Asp	Val	Leu	Gln	Val	Gly	Gln	Lys	Leu	Val	Ile					
		35					40								

(2) INFORMATION FOR SEQ ID NO:17:

(i) SEQUENCE CHARACTERISTICS:  
 (A) LENGTH: 43 amino acids  
 (B) TYPE: amino acid  
 (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:17:

Lys Tyr Thr Val Lys Ser Gly Asp Ser Leu Trp Lys Ile Ala Asn Asn  
1 5 10 15

Ile Asn Leu Thr Val Gln Gln Ile Arg Asn Ile Asn Asn Leu Lys Ser  
20 25 30

Asp Val Leu Tyr Val Gly Gln Val Leu Lys Leu  
35 40

(2) INFORMATION FOR SEQ ID NO:18:

(i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 45 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:18:

Thr	Tyr	Thr	Val	Lys	Ser	Gly	Asp	Thr	Ile	Trp	Ala	Leu	Ser	Ser	Lys
1				5					10					15	
Tyr	Gly	Thr	Ser	Val	Gln	Asn	Ile	Met	Ser	Trp	Asn	Asn	Leu	Ser	Ser
			20					25					30		
Ser	Ser	Ile	Tyr	Val	Gly	Gln	Val	Leu	Ala	Val	Lys	Gln			
		35					40					45			

(2) INFORMATION FOR SEQ ID NO:19:

(i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 45 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:19:

Thr	His	Ala	Val	Lys	Ser	Gly	Asp	Thr	Ile	Trp	Ala	Leu	Ser	Val	Lys
1				5					10					15	
Tyr	Gly	Val	Ser	Val	Gln	Asp	Ile	Met	Ser	Trp	Asn	Asn	Leu	Ser	Ser
			20					25					30		
Ser	Ser	Ile	Tyr	Val	Gly	Gln	Lys	Leu	Ala	Ile	Lys	Gln			
		35					40					45			

(2) INFORMATION FOR SEQ ID NO:20:

(i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 46 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:20:

Ser	Val	Lys	Val	Lys	Ser	Gly	Asp	Thr	Leu	Trp	Ala	Leu	Ser	Val	Lys
1				5					10					15	
Tyr	Lys	Thr	Ser	Ile	Ala	Gln	Leu	Lys	Ser	Trp	Asn	His	Leu	Ser	Ser
			20					25					30		
Asp	Thr	Ile	Tyr	Ile	Gly	Gln	Asn	Leu	Ile	Val	Ser	Gln	Ser		
		35					40					45			

(2) INFORMATION FOR SEQ ID NO:21:

- (i) SEQUENCE CHARACTERISTICS:  
 (A) LENGTH: 43 amino acids  
 (B) TYPE: amino acid  
 (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:21:

Thr	Tyr	Thr	Val	Lys	Ser	Gly	Asp	Thr	Leu	Trp	Gly	Ile	Ser	Gln	Arg
1				5					10					15	
Tyr	Gly	Ile	Ser	Val	Ala	Gln	Ile	Gln	Ser	Ala	Asn	Asn	Leu	Lys	Ser
			20					25					30		
Thr	Ile	Ile	Tyr	Ile	Gly	Gln	Lys	Leu	Leu	Leu					
			35				40								

(2) INFORMATION FOR SEQ ID NO:22:

- (i) SEQUENCE CHARACTERISTICS:  
 (A) LENGTH: 60 amino acids  
 (B) TYPE: amino acid  
 (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:22:

Thr	Tyr	Thr	Val	Lys	Lys	Gly	Asp	Thr	Leu	Trp	Asp	Ile	Ala	Gly	Arg
1				5					10					15	
Phe	Tyr	Gly	Asn	Ser	Thr	Gln	Trp	Arg	Lys	Ile	Trp	Asn	Ala	Asn	Lys
			20					25					30		
Thr	Ala	Met	Ile	Lys	Arg	Ser	Lys	Arg	Asn	Ile	Arg	Gln	Pro	Gly	His
			35				40					45			
Trp	Ile	Phe	Pro	Gly	Gln	Lys	Leu	Lys	Ile	Pro	Gln				
			50			55					60				

(2) INFORMATION FOR SEQ ID NO:23:

- (i) SEQUENCE CHARACTERISTICS:  
 (A) LENGTH: 60 amino acids  
 (B) TYPE: amino acid  
 (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:23:

Thr	Tyr	Thr	Val	Lys	Lys	Gly	Asp	Thr	Leu	Trp	Asp	Leu	Ala	Gly	Lys
1				5					10					15	
Phe	Tyr	Gly	Asp	Ser	Thr	Lys	Trp	Arg	Lys	Ile	Trp	Lys	Val	Asn	Lys
			20					25					30		
Lys	Ala	Met	Ile	Lys	Arg	Ser	Lys	Arg	Asn	Ile	Arg	Gln	Pro	Gly	His
			35				40					45			



Trp Ile Phe Pro Gly Gln Lys Leu Lys Ile Pro Gln  
50 55 60

(2) INFORMATION FOR SEQ ID NO:24:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 167 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:24:

Ala	Pro	Pro	Val	Glu	Leu	Ala	Ala	Asn	Asp	Leu	Pro	Ala	Pro	Leu	Gly	1	5	10	15
Glu	Pro	Leu	Pro	Ala	Ala	Pro	Ala	Asp	Pro	Ala	Pro	Pro	Ala	Asp	Leu	20	25	30	
Ala	Pro	Pro	Ala	Pro	Ala	Asp	Val	Ala	Pro	Pro	Val	Glu	Leu	Ala	Val	35	40	45	
Asn	Asp	Leu	Pro	Ala	Pro	Leu	Gly	Glu	Pro	Leu	Pro	Ala	Ala	Pro	Ala	50	55	60	
Asp	Pro	Ala	Pro	Pro	Ala	Asp	Leu	Ala	Pro	Pro	Ala	Pro	Ala	Asp	Leu	65	70	75	80
Ala	Pro	Pro	Ala	Pro	Ala	Asp	Leu	Ala	Pro	Pro	Ala	Pro	Ala	Asp	Leu	85	90	95	
Ala	Pro	Pro	Val	Glu	Leu	Ala	Val	Asn	Asp	Leu	Pro	Ala	Pro	Leu	Gly	100	105	110	
Glu	Pro	Leu	Pro	Ala	Ala	Pro	Ala	Glu	Leu	Ala	Pro	Pro	Ala	Asp	Leu	115	120	125	
Ala	Pro	Ala	Ser	Ala	Asp	Leu	Ala	Pro	Pro	Ala	Pro	Ala	Asp	Leu	Ala	130	135	140	
Pro	Pro	Ala	Pro	Ala	Glu	Leu	Ala	Pro	Pro	Ala	Pro	Ala	Asp	Leu	Ala	145	150	155	160
Pro	Pro	Ala	Ala	Val	Asn	Glu	165												

(2) INFORMATION FOR SEQ ID NO:25:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 11 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:25:

Ala	Pro	Pro	Val	Glu	Leu	Ala	Ala	Asn	Asp	Leu	1	5	10
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	---	---	----

(2) INFORMATION FOR SEQ ID NO:26:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 11 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:26:

Ala Pro Pro Val Glu Leu Ala Val Asn Asp Leu  
1 5 10

(2) INFORMATION FOR SEQ ID NO:27:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 15 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:27:

Pro Ala Pro Leu Gly Glu Pro Leu Pro Ala Ala Pro Ala Asp Leu  
1 5 10 15

(2) INFORMATION FOR SEQ ID NO:28:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 15 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:28:

Pro Ala Pro Leu Gly Glu Pro Leu Pro Ala Ala Pro Ala Glu Leu  
1 5 10 15

(2) INFORMATION FOR SEQ ID NO:29:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 7 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:29:

Pro Ala Pro Pro Ala Asp Leu  
1 5

(2) INFORMATION FOR SEQ ID NO:30:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 8 amino acids
- (B) TYPE: amino acid

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:30:

Ala Pro Pro Ala Pro Ala Asp Leu  
1 5

(2) INFORMATION FOR SEQ ID NO:31:

(i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 8 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:31:

Ala Pro Pro Ala Pro Ala Asp Val  
1 5

(2) INFORMATION FOR SEQ ID NO:32:

(i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 8 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:32:

Ala Pro Pro Ala Pro Ala Glu Leu  
1 5

(2) INFORMATION FOR SEQ ID NO:33:

(i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 8 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:33:

Ala Pro Pro Ala Pro Ala Glu Val  
1 5

(2) INFORMATION FOR SEQ ID NO:34:

(i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 478 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:34:

Met 1	Asn	Met	Lys	Lys 5	Ala	Thr	Ile	Ala	Ala 10	Thr	Ala	Gly	Ile	Ala 15	Val
Thr	Ala	Phe	Ala 20	Ala	Pro	Thr	Ile	Ala 25	Ser	Ala	Ser	Thr	Val 30	Val	Val
Glu	Ala	Gly 35	Asp	Thr	Leu	Trp	Gly 40	Ile	Ala	Gln	Ser	Lys 45	Gly	Thr	Thr
Val	Asp 50	Ala	Ile	Lys	Lys	Ala 55	Asn	Asn	Leu	Thr	Thr 60	Asp	Lys	Ile	Val
Pro 65	Gly	Gln	Lys	Leu	Gln 70	Val	Asn	Asn	Glu	Val 75	Ala	Ala	Ala	Glu	Lys 80
Thr	Glu	Lys	Ser	Val 85	Ser	Ala	Thr	Trp	Leu 90	Asn	Val	Arg	Thr	Gly 95	Ala
Gly	Val	Asp	Asn 100	Ser	Ile	Ile	Thr	Ser 105	Ile	Lys	Gly	Gly	Thr 110	Lys	Val
Thr	Val	Glu 115	Thr	Thr	Glu	Ser	Asn 120	Gly	Trp	His	Lys	Ile 125	Thr	Tyr	Asn
Asp	Gly 130	Lys	Thr	Gly	Phe	Val 135	Asn	Gly	Lys	Tyr	Leu 140	Thr	Asp	Lys	Ala
Val 145	Ser	Thr	Pro	Val	Ala 150	Pro	Thr	Gln	Glu	Val 155	Lys	Lys	Glu	Thr	Thr 160
Thr	Gln	Gln	Ala	Ala 165	Pro	Val	Ala	Glu	Thr 170	Lys	Thr	Glu	Val	Lys 175	Gln
Thr	Thr	Gln	Ala 180	Thr	Thr	Pro	Ala	Pro 185	Lys	Val	Ala	Glu	Thr 190	Lys	Glu
Thr	Pro	Val 195	Ile	Asp	Gln	Asn	Ala 200	Thr	Thr	His	Ala	Val 205	Lys	Ser	Gly
Asp	Thr 210	Ile	Trp	Ala	Leu	Ser 215	Val	Lys	Tyr	Gly	Val 220	Ser	Val	Gln	Asp
Ile 225	Met	Ser	Trp	Asn	Asn 230	Leu	Ser	Ser	Ser	Ser 235	Ile	Tyr	Val	Gly	Gln 240
Lys	Leu	Ala	Ile	Lys 245	Gln	Thr	Ala	Asn	Thr 250	Ala	Thr	Pro	Lys	Ala 255	Glu
Val	Lys	Thr	Glu 260	Ala	Pro	Ala	Ala	Glu 265	Lys	Gln	Ala	Ala	Pro 270	Val	Val
Lys	Glu	Asn 275	Thr	Asn	Thr	Asn	Thr 280	Ala	Thr	Thr	Glu	Lys 285	Lys	Glu	Thr
Ala	Thr 290	Gln	Gln	Gln	Thr	Ala 295	Pro	Lys	Ala	Pro	Thr 300	Glu	Ala	Ala	Lys
Pro 305	Ala	Pro	Ala	Pro	Ser 310	Thr	Asn	Thr	Asn	Ala 315	Asn	Lys	Thr	Asn	Thr 320

Asn Thr Asn Thr Asn Asn Thr Asn Thr Pro Ser Lys Asn Thr Asn Thr  
325 330 335

Asn Ser Asn Thr Asn Thr Asn Thr Asn Ser Asn Thr Asn Ala Asn Gln  
340 345 350

Gly Ser Ser Asn Asn Asn Ser Asn Ser Ser Ala Ser Ala Ile Ile Ala  
355 360 365

Glu Ala Gln Lys His Leu Gly Lys Ala Tyr Ser Trp Gly Gly Asn Gly  
370 375 380

Pro Thr Thr Phe Asp Cys Ser Gly Tyr Thr Lys Tyr Val Phe Ala Lys  
385 390 395 400

Ala Gly Ile Ser Leu Pro Arg Thr Ser Gly Ala Gln Tyr Ala Ser Thr  
405 410 415

Thr Arg Ile Ser Glu Ser Gln Ala Lys Pro Gly Asp Leu Val Phe Phe  
420 425 430

Asp Tyr Gly Ser Gly Ile Ser His Val Gly Ile Tyr Val Gly Asn Gly  
435 440 445

Gln Met Ile Asn Ala Gln Asp Asn Gly Val Lys Tyr Asp Asn Ile His  
450 455 460

Gly Ser Gly Trp Gly Lys Tyr Leu Val Gly Phe Gly Arg Val  
465 470 475

(2) INFORMATION FOR SEQ ID NO:35:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 758 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 66..728

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:35:

ACCAAGGAGA AGGACGACCC CGGTGTGCCT CGGCCGCCGA TCAGCGAGGA CTCGCCATGG	60
ACACC ATG ACT CTC TTC ACC ACT TCC GCC ACC CGC TCC CGC CGT GCC	107
Met Thr Leu Phe Thr Thr Ser Ala Thr Arg Ser Arg Arg Ala	
1 5 10	
ACC GCC TCG ATC GTC GCG GGC ATG ACC CTC GCC GGC GCC GCC GCC GTG	155
Thr Ala Ser Ile Val Ala Gly Met Thr Leu Ala Gly Ala Ala Ala Val	
15 20 25 30	
GGC TTC TCC GCC CCG GCC CAG GCC GCC ACC GTG GAC ACC TGG GAC CGC	203
Gly Phe Ser Ala Pro Ala Gln Ala Ala Thr Val Asp Thr Trp Asp Arg	
35 40 45	
CTC GCC GAG TGC GAG TCC AAC GGC ACC TGG GAC ATC AAC ACC GGC AAC	251

Leu	Ala	Glu	Cys	Glu	Ser	Asn	Gly	Thr	Trp	Asp	Ile	Asn	Thr	Gly	Asn		
			50					55					60				
GGC	TTC	TAC	GGC	GGC	GTG	CAG	TTC	ACC	CTG	TCC	TCC	TGG	CAG	GCC	GTC	299	
Gly	Phe	Tyr	Gly	Gly	Val	Gln	Phe	Thr	Leu	Ser	Ser	Trp	Gln	Ala	Val		
		65					70					75					
GGC	GGC	GAA	GGC	TAC	CCG	CAC	CAG	GCC	TCG	AAG	GCC	GAG	CAG	ATC	AAG	347	
Gly	Gly	Glu	Gly	Tyr	Pro	His	Gln	Ala	Ser	Lys	Ala	Glu	Gln	Ile	Lys		
	80					85					90						
CGC	GCC	GAG	ATC	CTC	CAG	GAC	CTG	CAG	GGC	TGG	GGC	GCG	TGG	CCG	CTG	395	
Arg	Ala	Glu	Ile	Leu	Gln	Asp	Leu	Gln	Gly	Trp	Gly	Ala	Trp	Pro	Leu		
95					100				105						110		
TGC	TCG	CAG	AAG	CTG	GGC	CTG	ACC	CAG	GCT	GAC	GCG	GAC	GCC	GGT	GAC	443	
Cys	Ser	Gln	Lys	Leu	Gly	Leu	Thr	Gln	Ala	Asp	Ala	Asp	Ala	Gly	Asp		
				115					120					125			
GTG	GAC	GCC	ACC	GAG	GCC	GCC	CCG	GTC	GCC	GTG	GAG	CGC	ACG	GCC	ACC	491	
Val	Asp	Ala	Thr	Glu	Ala	Ala	Pro	Val	Ala	Val	Glu	Arg	Thr	Ala	Thr		
				130				135					140				
GTG	CAG	CGC	CAG	TCC	GCC	GCG	GAC	GAG	GCT	GCC	GCC	GAG	CAG	GCC	GCT	539	
Val	Gln	Arg	Gln	Ser	Ala	Ala	Asp	Glu	Ala	Ala	Ala	Glu	Gln	Ala	Ala		
		145					150					155					
GCC	GCG	GAG	CAG	GCC	GTC	GTC	GCC	GAG	GCC	GAG	ACC	ATC	GTC	GTC	AAG	587	
Ala	Ala	Glu	Gln	Ala	Val	Val	Ala	Glu	Ala	Glu	Thr	Ile	Val	Val	Lys		
		160				165					170						
TCC	GGT	GAC	TCC	CTC	TGG	ACG	CTC	GCC	AAC	GAG	TAC	GAG	GTG	GAG	GGT	635	
Ser	Gly	Asp	Ser	Leu	Trp	Thr	Leu	Ala	Asn	Glu	Tyr	Glu	Val	Glu	Gly		
175					180					185					190		
GGC	TGG	ACC	GCC	CTC	TAC	GAG	GCC	AAC	AAG	GGC	GCC	GTC	TCC	GAC	GCC	683	
Gly	Trp	Thr	Ala	Leu	Tyr	Glu	Ala	Asn	Lys	Gly	Ala	Val	Ser	Asp	Ala		
				195					200					205			
GCC	GTG	ATC	TAC	GTC	GGC	CAG	GAG	CTC	GTC	CTG	CCG	CAG	GCC	TGAGACGCCT	735		
Ala	Val	Ile	Tyr	Val	Gly	Gln	Glu	Leu	Val	Leu	Pro	Gln	Ala				
			210					215					220				
GACCGGCCCC	CCGACCGGT	ACC														758	

(2) INFORMATION FOR SEQ ID NO:36:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 220 amino acids
  - (B) TYPE: amino acid
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:36:

Met	Thr	Leu	Phe	Thr	Thr	Ser	Ala	Thr	Arg	Ser	Arg	Arg	Ala	Thr	Ala		
1				5					10					15			
Ser	Ile	Val	Ala	Gly	Met	Thr	Leu	Ala	Gly	Ala	Ala	Ala	Val	Gly	Phe		

[illegible]

(i) SEQUENCE CHARACTERISTICS:  
 (A) LENGTH: 33 base pairs  
 (B) TYPE: nucleic acid  
 (C) STRANDEDNESS: single  
 (D) TOPOLOGY: linear

2

33

(i) SEQUENCE CHARACTERISTICS:  
 (A) LENGTH: 19 amino acids  
 (B) TYPE: amino acid  
 (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:38:

Ala	Thr	Val	Asp	Thr	Trp	Asp	Arg	Leu	Ala	Glu	Glu	Xaa	Ser	Asn	Gly
1				5				10						15	

Thr Xaa Asp

(2) INFORMATION FOR SEQ ID NO:39:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 18 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:39:

CCGCCGTAGA AGCCGTTG

18

(2) INFORMATION FOR SEQ ID NO:40:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 19 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:40:

AGTTCACCCT GTCCTCCTG

19

(2) INFORMATION FOR SEQ ID NO:41:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 23 base pairs

(B) TYPE: nucleic acid

(C) STRANDEDNESS: single

(D) TOPOLOGY: linear

(ix) FEATURE:

(A) NAME/KEY: misc\_feature

(B) LOCATION: 9

(D) OTHER INFORMATION: /note= "N is inosine"

(ix) FEATURE:

(A) NAME/KEY: misc\_feature

(B) LOCATION: 15

(D) OTHER INFORMATION: /note= "N is inosine"

(ix) FEATURE:

(A) NAME/KEY: misc\_feature

(B) LOCATION: 21

(D) OTHER INFORMATION: /note= "N is inosine"



(xi) SEQUENCE DESCRIPTION: SEQ ID NO:41:

GCYTGRTGNG GRTANCCYTC NCC

23

(2) INFORMATION FOR SEQ ID NO:42:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 12 amino acids
  - (B) TYPE: amino acid
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:42:

Val	Gly	Gly	Glu	Gly	Tyr	Pro	His	Gln	Ala	Ser	Lys
1				5					10		

(2) INFORMATION FOR SEQ ID NO:43:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 182 amino acids
  - (B) TYPE: amino acid
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:43:

Ala	Thr	Val	Asp	Thr	Trp	Asp	Arg	Leu	Ala	Glu	Cys	Glu	Ser	Asn	Gly
1				5					10					15	
Thr	Trp	Asp	Ile	Asn	Thr	Gly	Asn	Gly	Phe	Tyr	Gly	Gly	Val	Gln	Phe
			20					25					30		
Thr	Leu	Ser	Ser	Trp	Gln	Ala	Val	Gly	Gly	Glu	Gly	Tyr	Pro	His	Gln
		35				40						45			
Ala	Ser	Lys	Ala	Glu	Gln	Ile	Lys	Arg	Ala	Glu	Ile	Leu	Gln	Asp	Leu
	50					55					60				
Gln	Gly	Trp	Gly	Ala	Trp	Pro	Leu	Cys	Ser	Gln	Lys	Leu	Gly	Leu	Thr
65					70					75					80
Gln	Ala	Asp	Ala	Asp	Ala	Gly	Asp	Val	Asp	Ala	Thr	Glu	Ala	Ala	Pro
			85						90					95	
Val	Ala	Val	Glu	Arg	Thr	Ala	Thr	Val	Gln	Arg	Gln	Ser	Ala	Ala	Asp
			100					105					110		
Glu	Ala	Ala	Ala	Glu	Gln	Ala	Ala	Ala	Ala	Glu	Gln	Ala	Val	Val	Ala
		115					120					125			
Glu	Ala	Glu	Thr	Ile	Val	Val	Lys	Ser	Gly	Asp	Ser	Leu	Trp	Thr	Leu
	130					135					140				
Ala	Asn	Glu	Tyr	Glu	Val	Glu	Gly	Gly	Trp	Thr	Ala	Leu	Tyr	Glu	Ala
145					150				155					160	
Asn	Lys	Gly	Ala	Val	Ser	Asp	Ala	Ala	Val	Ile	Tyr	Val	Gly	Gln	Glu

165

170

175

Leu Val Leu Pro Gln Ala  
180

(2) INFORMATION FOR SEQ ID NO:44:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 299 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 3..299

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:44:

GG ATC CGC ACC GCC GCG GTA ACC CTG GTC GCC GCG ACC GCA CTC GGG	47
Ile Arg Thr Ala Ala Val Thr Leu Val Ala Ala Thr Ala Leu Gly	
1 5 10 15	
GCG ACC GGC GAA GCG GTG GCC GCG CCC TCG GCG CCC CTG CGC ACC GAC	95
Ala Thr Gly Glu Ala Val Ala Ala Pro Ser Ala Pro Leu Arg Thr Asp	
20 25 30	
TGG GAC GCC ATC GCC GCG TGC GAG TCC AGC GGC AAC TGG CAG GCG AAC	143
Trp Asp Ala Ile Ala Ala Cys Glu Ser Ser Gly Asn Trp Gln Ala Asn	
35 40 45	
ACC GGC AAC GGC TAC TAC GGC GGC CTG CAG TTC GCA CGG TCC AGC TGG	191
Thr Gly Asn Gly Tyr Tyr Gly Gly Leu Gln Phe Ala Arg Ser Ser Trp	
50 55 60	
ATC GCC GCC GGC GGC CTC AAG TAC GCC CCG CGC GCG GAC CTC GCC ACC	239
Ile Ala Ala Gly Gly Leu Lys Tyr Ala Pro Arg Ala Asp Leu Ala Thr	
65 70 75	
CGC GGC GAG CAG ATC GCC GTG GCG GAA CGC CTC GCC CGT CTG CAG GGG	287
Arg Gly Glu Gln Ile Ala Val Ala Glu Arg Leu Ala Arg Leu Gln Gly	
80 85 90 95	
ATG TCC GCC TGG	299
Met Ser Ala Trp	

(2) INFORMATION FOR SEQ ID NO:45:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 99 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:45:

Ile Arg Thr Ala Ala Val Thr Leu Val Ala Ala Thr Ala Leu Gly Ala  
1 5 10 15  
Thr Gly Glu Ala Val Ala Ala Pro Ser Ala Pro Leu Arg Thr Asp Trp  
20 25 30  
Asp Ala Ile Ala Ala Cys Glu Ser Ser Gly Asn Trp Gln Ala Asn Thr  
35 40 45  
Gly Asn Gly Tyr Tyr Gly Gly Leu Gln Phe Ala Arg Ser Ser Trp Ile  
50 55 60  
Ala Ala Gly Gly Leu Lys Tyr Ala Pro Arg Ala Asp Leu Ala Thr Arg  
65 70 75 80  
Gly Glu Gln Ile Ala Val Ala Glu Arg Leu Ala Arg Leu Gln Gly Met  
85 90 95  
Ser Ala Trp

(2) INFORMATION FOR SEQ ID NO:46:

- (i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 34 base pairs  
(B) TYPE: nucleic acid  
(C) STRANDEDNESS: single  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:46:

GTCAGAATTC ATATGGCCAC CGTGGACACC TGGG

34

(2) INFORMATION FOR SEQ ID NO:47:

- (i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 33 base pairs  
(B) TYPE: nucleic acid  
(C) STRANDEDNESS: single  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:47:

TGACGGATCC TATTAGGCCT GCGGCAGGAC GAG

33

(2) INFORMATION FOR SEQ ID NO:48:

- (i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 35 base pairs  
(B) TYPE: nucleic acid  
(C) STRANDEDNESS: single  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:48:

ATCAGAATTC ATATGGACGA CATCGATTGG GACGC

35

(2) INFORMATION FOR SEQ ID NO:49:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 29 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:49:

CGCAGGATCC CCTCAATCGT CCCTGCTCC

29

(2) INFORMATION FOR SEQ ID NO:50:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 23 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:50:

GAAGAGAATT CCTTCCATCA CGA

23

(2) INFORMATION FOR SEQ ID NO:51:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 22 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:51:

CCAAACGAAT TCGGTCAATC AC

22

(2) INFORMATION FOR SEQ ID NO:52:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 26 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:52:

GCAAGGATCC CAGACTAAAA AAACAG

26

(2) INFORMATION FOR SEQ ID NO:53:

- (i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 27 base pairs  
(B) TYPE: nucleic acid  
(C) STRANDEDNESS: single  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:53:

ATCAGGATCC ATATTATTAG TTTAAGA

27

2) INFORMATION FOR SEQ ID NO:54:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 663 base pairs  
(B) TYPE: nucleic acid  
(C) STRANDEDNESS: single stranded  
(D) TOPOLOGY: linear

(ix) FEATURE:

(A) NAME/KEY: CDS  
(B) LOCATION: 1..663

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:54:

atg act ctc ttc acc act tcc gcc acc cgc tcc cgc cgt gcc acc gcc	48
Met Thr Leu Phe Thr Thr Ser Ala Thr Arg Ser Arg Arg Ala Thr Ala	
1 5 10 15	
tcg atc gtc gcg ggc atg acc ctc gcc ggc gcc gcc gcc gtg ggc ttc	96
Ser Ile Val Ala Gly Met Thr Leu Ala Gly Ala Ala Val Gly Phe	
20 25 30	
tcc gcc ccg gcc cag gcc gcc acc gtg gac acc tgg gac cgc ctc gcc	144
Ser Ala Pro Ala Gln Ala Ala Thr Val Asp Thr Trp Asp Arg Leu Ala	
35 40 45	
gag tgc gag tcc aac ggc acc tgg gac atc aac acc ggc aac ggc ttc	192
Glu Cys Glu Ser Asn Gly Thr Trp Asp Ile Asn Thr Gly Asn Gly Phe	
50 55 60	
tac ggc ggc gtg cag ttc acc ctg tcc tcc tgg cag gcc gtc ggc ggc	240
Tyr Gly Gly Val Gln Phe Thr Leu Ser Ser Trp Gln Ala Val Gly Gly	
65 70 75 80	
gaa ggc tac ccg cac cag gcc tcg aag gcc gag cag atc aag cgc gcc	288
Glu Gly Tyr Pro His Gln Ala Ser Lys Ala Glu Gln Ile Lys Arg Ala	
85 90 95	
gag atc ctc cag gac ctg cag ggc tgg ggc gcg tgg ccg ctg tgc tcg	336
Glu Ile Leu Gln Asp Leu Gln Gly Trp Gly Ala Trp Pro Leu Cys Ser	
100 105 110	
cag aag ctg ggc ctg acc cag gct gac gcg gac gcc ggt gac gtg gac	384
Gln Lys Leu Gly Leu Thr Gln Ala Asp Ala Asp Ala Gly Asp Val Asp	
115 120 125	
gcc acc gag gcc gcc ccg gtc gcc gtg gag cgc acg gcc acc gtg cag	432

(2) INFORMATION FOR SEQ ID NO:55:

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:55:

(2) INFORMATION FOR SEO ID NO:56:

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:56:

(2) INFORMATION FOR SEO ID NO:57:

(i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 8 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:57:

Ala Pro Pro Ala Pro Ala Glu Leu  
1 5

(2) INFORMATION FOR SEQ ID NO:58:

(i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 4 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:58:

Ala Pro Pro Ala  
1

(2) INFORMATION FOR SEQ ID NO:59:

(i) SEQUENCE CHARACTERISTICS:  
(A) LENGTH: 4 amino acids  
(B) TYPE: amino acid  
(D) TOPOLOGY: linear

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:59:

Ala Val Asn Asp  
1